

Optical Feather and Foil for Shape and Dynamic Load Sensing of Critical Flight Surfaces, Phase I

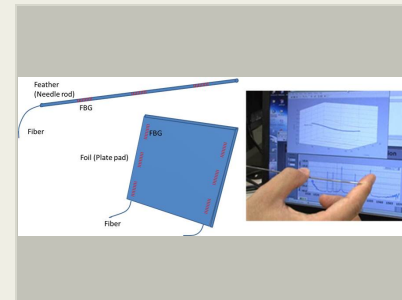
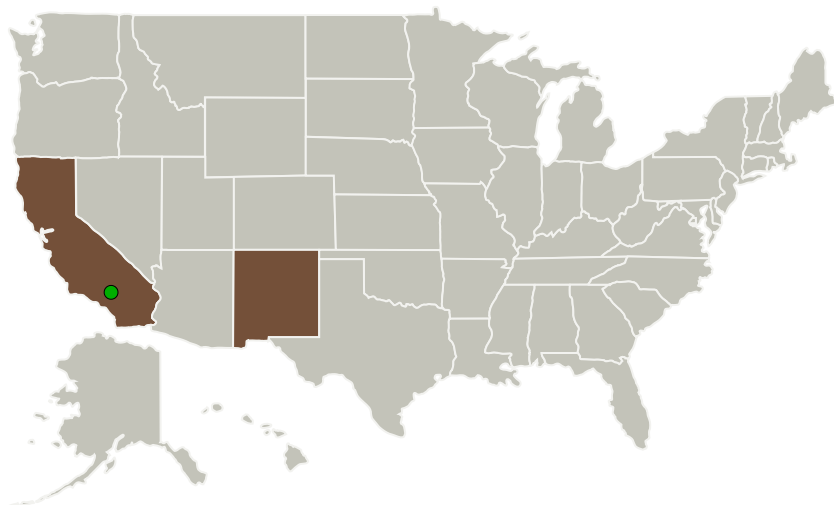
Completed Technology Project (2013 - 2014)



Project Introduction

Future flight vehicles may comprise complex flight surfaces requiring coordinated in-situ sensing and actuation. Inspired by the complexity of the flight surfaces on the wings and tail of a bird, it is argued that increasing the number of interdependent flight surfaces from just a few, as is normal in an airplane, to many, as in the feathers of a bird, can significantly enlarge the flight envelope. To enable elements of an eco-inspired Dynamic Servo-Elastic (DSE) flight control system, IFOS proposes a multiple functionality-sensing element analogous to a feather, consisting of a very thin (gauge 18 or 20) tube with strain sensors and algorithms for deducing the shape of the "feather" by measuring strain at multiple points. It is envisaged that the "feather" will act as a unit of sensing and/or actuation for establishing shape, position, static and dynamic loads on flight surfaces and in critical parts. IFOS proposes to develop advanced sensing hardware and software control algorithms to demonstrate the proposed DSE flight control concept. The hardware development involves an array of optical fiber based sensorized needle tubes for attachment to key parts for dynamic flight surface measurement.

Primary U.S. Work Locations and Key Partners



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Table of Contents

Project Introduction	1
Primary U.S. Work Locations and Key Partners	1
Project Transitions	2
Images	2
Organizational Responsibility	2
Project Management	2
Technology Maturity (TRL)	3
Technology Areas	3
Target Destinations	3

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Organizations Performing Work	Role	Type	Location
Intelligent Fiber Optic Systems Corporation	Lead Organization	Industry	Santa Clara, California
● Armstrong Flight Research Center(AFRC)	Supporting Organization	NASA Center	Edwards, California
New Mexico Institute of Mining and Technology	Supporting Organization	Academia	Socorro, New Mexico

Primary U.S. Work Locations

California	New Mexico
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Project Transitions

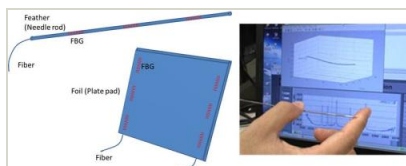
▶ **May 2013:** Project Start

✓ **May 2014:** Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/138393>)

Images



Project Image

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(<https://techport.nasa.gov/image/129365>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Intelligent Fiber Optic Systems Corporation

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Richard J Black

Co-Investigator:

Richard W Black

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Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **3**



Technology Areas

Primary:

- TX04 Robotic Systems
 - └ TX04.1 Sensing and Perception
 - └ TX04.1.3 Onboard Mapping and Data Analysis

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System